UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105

May 18, 2017

Mr. Anthony R. Brown
Environmental Manager
Atlantic Richfield Company
4 Centerpointe Drive, LPR 4-435
La Palma, CA 90623-1066

Subject: EPA comments on Atlantic Richfield's Groundwater Technical Data Summary Report (TDSR) Version No. 2, dated January 25, 2017 and ARC Response to Comments on the Groundwater TDSR, dated November 4, 2016; Leviathan Mine Superfund Site, Alpine County, California.

Dear Mr. Brown:

The U.S. Environmental Protection Agency (EPA) has completed its review of Atlantic Richfield's November 14, 2016 response to EPA and Regional Board comments on the Draft Groundwater Technical Data Summary Report (TDSR); and the Groundwater Technical Data Summary Report Version No. 2 dated January 25, 2017; Leviathan Mine Superfund Site, Alpine County, California. This work was submitted to EPA pursuant to Administrative Order for Remedial Investigation and Feasibility Study, Leviathan Mine, Alpine County, California (CERCLA Docket No. 2008-18, June 23, 2008).

Background: On February 26, 2015, EPA provided an e-mail identifying next steps in regards to the Groundwater Well Monitoring Program at Leviathan Mine. On March 31, 2015, EPA provided an annotated draft agenda outlining requested data validation and data usability elements necessary to ensure robust data set presentations at a meeting scheduled for April 1, 2016. EPA followed that meeting with formal comments dated April 2, 2015. At EPA's request ARC presented the initial groundwater evaluation to EPA as two power point slide presentations at the face to face quarterly technical meeting on April 30, 2015. At that meeting, EPA requested that ARC follow the discussion with a submittal of a formal groundwater assessment document that could be periodically updated and eventually contribute to the RI/FS report. ARC prepared a June 30, 2015 Groundwater Evaluation Summary in response to that request.

On November 25, 2015 EPA's comments included requests for integration of pre-RI information, evaluation of environmental isotope data, consideration of historical information from the site, and evaluation of identified Sources (Channel Underdrain, Adit, Delta Seep, and Aspen Seep) with respect to groundwater flow that were partially addressed in the TDSR. On March 4, 2016 EPA provided an email again requesting submittal of the groundwater report.

ARC submitted the Groundwater TDSR on March 21, 2016.

On September 27, 2016 EPA provided general and specific technical review comments on the TDSR. requesting ARC to provide a line by line response within 30 days; and to agree to a date certain for the next revised final groundwater TDSR that incorporates all EPA requested changes, add additional new data, and provides the full summary of the QC and DQA consistent with the approved QAP. Further, that the report be provided no later than 120 days after field sampling is completed.

On November 4, 2016 ARC provided a response to EPA comments; and on the January 25, 2017 ARC provided the associated Groundwater Technical Data Summary Report Version No. 2.

EPA has completed its review of these two documents and finds that some EPA comments have been addressed adequately and those are found in Attachment A: Previous Comments. However, ARC remains unresponsive to a number of important previous comments:

General Comments:

- **Previous EPA comment dated September 27, 2016 G1: Incomplete:** The TDSR represents a substantial improvement with respect to former groundwater submittals prepared for the site. However, EPA still finds that the document is incomplete and unnecessarily delayed. EPA has provided comments as far back as February of 2015, and several issues remain before EPA accepts the TDSR as complete. The report does not fully consider available piezometric and chemical data. Available groundwater elevation measurements from 1998 and 1999, and since 2006 were not considered, chemistry over time was not evaluated, groundwater surface(s) within mine waste were not adequately characterized, and Source specific groundwater flow has not been characterized. **ARC Response November 4, 2016:** ARC states that the TDSR was not intended to provide a comprehensive report of all groundwater data from the site, and expresses disagreement regarding delay of the report. ARC refers to the response to Comment G2, and also states that historical data will be used selectively to support interpretation of the nature and extent of contamination to provide context, but that historical data will not be used to support remedial decision making. **EPA Comment:** The January 25, 2017 revised report provides a much improved description of historical and current groundwater elevation data, assessment of temporal chemical trends, and consideration of source specific flow paths in comparison with the June 30, 2015 report. The available groundwater elevation measurements are appropriately considered in the revised report. However, as discussed in Comment G2, please include the historical analytical data to assess site aspects such as temporal trends and chemical fate and transport necessary to identify a protective remedy.

- **Previous EPA comment dated September 27, 2016 G2: Limited Scope of Analysis:** The report inappropriately limits certain analysis to information from RI efforts undertaken by AMEC. An example of this limitation is consideration of groundwater elevation measurements collected from 2010 to 2014. Groundwater elevation measurements from selected wells and piezometers are available since 2006. Another example is lack of consideration of chemistry data from the 1998 and 1999 SRK Consulting report. Omitting such historical data from analysis reduces the ability to detect and assess the significance of temporal and spatial changes in the potentiometric surface, groundwater flow, and/or groundwater chemistry at the site. Because future remedies at the site will need to address the long term site conditions, all available information should be fully considered with respect to the remedial investigation to broaden understanding of key site characteristics such as groundwater flow and chemistry. **ARC Response:** ARC refers to the

response to Comment G1 and quotes the NCP as a basis for not using historical site information to support remedial decision making. **EPA Comment:** Limiting the groundwater (or any other matrix) data to that collected by ARC during a short period of time will limit the understanding of site risks. Please ensure that existing historical piezometric and analytical data is assessed for comparability with RI data. Data that are comparable should be used to assess site aspects such as temporal trends, and physical and chemical processes affecting chemical fate and transport to ensure that current and potential threats are accounted for during decision making.

- **Previous EPA comment dated September 27, 2016 G4: Groundwater Characteristics by Source:** Each of the identified Sources (Adit, Channel Underdrain or CUD, Delta Seep, and Aspen Seep) has unique chemical characteristics. The current report does not acknowledge these differences and does not clearly identify the associated groundwater or acid and metal origin to each Source. Please ensure that the report includes assessment of the area and volume of the groundwater system (from background areas, through mine waste to discharge) for each of the Sources. Organizing the groundwater information according to Source will likely increase the utility of the very general discussions that were provided about groundwater flow, groundwater chemistry, and contaminant distribution in the current report. Focus on each Source would also result in organizing and summarizing information to better support evaluation of contaminant fate and transport, and remedy evaluation. On August 30, 2016; EPA provided a draft agenda requesting this type of presentation be provided at our September 29, 2016 technical meeting. **ARC Response:** ARC committed to evaluating chemical differences and considering the need to further refine the area and volume of groundwater flow to acid drainage discharges. **EPA Comment:** The revised report includes evaluations of groundwater flow paths and associated chemical characteristics at the Adit, through the Leviathan Creek Study Area (LCSA), and in the Aspen Creek Study Area (ACSA). While this provides a substantial improvement, the evaluations in the current report are overly simplified and therefore may lead to misinterpretation of the site. For example, the LCSA flow path evaluation (Section 7.3.2.2) simply considers observed water chemistry along the flow path without acknowledging that this flow path includes inputs from up gradient locations (MW-01, MW-07, MW-11) as well as site affected locations (MW-2S). ARC simply focused on lack of a simple linear water quality evolution along the flow path. Please ensure the analysis is revised to fully acknowledges the various inputs. Please provide an analysis that includes full consideration of the various sources, and their mixing for assessing the fate and transport of acid and metals at the site.

- **Previous EPA comment dated September 27, 2016 G5: Groundwater Chemistry:** The discussions of groundwater chemistry are very general, and do not include comparison with Source chemistry. It is unclear how chemistry varies across the site and along Source-specific flow paths. While different types of groundwater are mentioned, their distribution across the site are not described in sufficient detail to support Source assessment. The report should be augmented by adding comparisons of groundwater and Source chemistry, and by addition of descriptions of the chemical variations along Source specific flow paths as described in General Comment 3. **ARC Response:** ARC referred to their response to Comment G4, and committed to augmenting the groundwater chemistry discussion 'as necessary'. **EPA Comment:** The January 25, 2017 report is a significant improvement over the earlier report. However, discussions of the evolution of groundwater chemistry remain inconclusive, in part because of overly simplified consideration of water sources along the flow path (for example the LCSA flow path). ARC should include additional details on the groundwater chemistry as described in Comment G4, and the Additional Comments below.

Specific Comments:

- **Previous EPA comment dated September 27, 2016 S1: Executive Summary, Problem Identification and Data Quality Objectives Final Bullet on Page 5:** The bullet states that the TDSR will be revised as validation and assessment of additional data are completed. The text should be revised to state that an annual update will be provided. Further, the text should acknowledge that this report is intended to provide the basis (as an appendix) and to support the corresponding section(s) of the Remedial Investigation/Feasibility (RI/FS) report requested by EPA in 2018. **ARC Response November 4, 2016:** ARC committed to managing the groundwater data in accordance with the June 2016 QAPP, and reporting results of data validation in future TDSRs or annual summary reports. **EPA Comment:** Section 11.0 of the January 25, 2017 revised report still does not include preparing an annual groundwater update. Groundwater and surface water could change significantly over an annual cycle. As previously requested, ARC is directed to revise the text to state that an annual update will be provided.

- **Previous EPA comment dated September 27, 2016 S2: Executive Summary, Groundwater Flow System, Pit Study Area, Second Sub-Bullet on Page 6:** This bullet concerns interpretation of observations reported in the text regarding groundwater levels and Tunnel 3. The interpretation is poorly supported in the current document. Please include appropriate figures and sections. For ex ample; a diagrammatic figure and cross section showing the relative positions of Tunnel 3 and the inferred fracture zone that supplied water to the tunnel, with respect to existing features. This information is necessary to support evaluation of alternative conclusions. **ARC Response:** ARC committed to providing the requested figures and sections. **EPA Comment:** Figure 3-2 was provided that shows Tunnel 3 and Tunnel 5. However, the text was amended to refer to Tunnel 4, and Tunnel 4 is not shown on the figure.

  Comparison of the 1933 document titled *Property of Leviathan Sulphur Company* with the 1981 Regional Board memorandum prepared after a 1981 interview of Frank Laird, Robert C. Thompson, and C.J. "Jerry" Houck by Jerrold Peacock reveals inconsistencies between the two documents. In particular, the observation of 30 gpm flow associated with Tunnel No. 3 in the 1933 document appears to be assigned to Tunnel 4 in the 1981 memorandum, and the distance along Tunnel 3 associated with significant inflow of water during mining was mistakenly attributed to drilling in the 1981 memorandum. However, Tunnel 4 is not shown on the 1946 map prepared by Siskon, nor is any feature shown on the 1946 map that is at the reported elevation of Tunnel 4 (a note on the 1946 map indicates that it is focused on 'all work on No. 3 Tunnel Level or above'). Tunnel 4 was also mentioned in the 1933 document and the 1981 Regional Board memorandum. The 1933 document states that 'very little' water flowed from Tunnel No. 4.

  EPA considers the 1933 document to be the more reliable source as it was prepared closer in time to the actual events described, and it corresponds with a map prepared in 1946 by the Siskon Mining Corporation that shows mine features. EPA considers information from the 1981 memorandum to be questionable unless corroborated by independent sources such as the 1933 memorandum and 1946 Siskon map. Please remove inferences or conclusions that depend on information from the 1981 memorandum. Please instead add text using the data from the other information sources. Please revise the report text as described in comments S7, S9, S10, S11.

  Please revise Figure 3-2 to include the location for Tunnel 4, or if the Tunnel 4 location cannot be verified, remove reference to Tunnel 4 from the report.

The text and general observations of flow appear to be inconsistent. The flow from Tunnel 3 was observed to be significant (750 gallons per minute(gpm) initially, stabilizing at 30 gpm, Moore 1933); and the current report prepared by ARC concludes that the pre-mining groundwater levels in the vicinity could have been up to 60 feet higher than current groundwater levels. However, based on the geometry of Figure 3-2, the pre-mining groundwater levels were likely much higher than 60 feet above currently measured post-mining groundwater levels. EPA notes that raising the current groundwater level by 60 feet just reaches the floor of Tunnel 3 (as shown on Figure 3-2), A higher groundwater head would be necessary to account for the flows reported by Moore (1933). Further, the Pit Evaluation (Appendix D to Atlantic Richfield's January 19, 2017 Reference FRI work plan) estimated 70 to 100 feet of groundwater elevation decline due to drainage from Tunnel 5. Please modify this text to more accurately reflect the observations of Moore (1933) and findings from the Pit Evaluation. *These observations suggest that groundwater elevations declined more than 100 feet in the vicinity of the tunnels before the pit was excavated.*

Conceptually, the tunnels contributed to dewatering the rock mass that was later removed during open pit mining, as well as dewatering remaining in-situ rock. Excavation of the pit is also expected to have resulted in further dewatering of the surrounding rock mass. A portion of the dewatered area is shown by the deflection of the potentiometric surfaces at the pit area on Figures 6-3, 6-4, 6-5, and 6-7. The Pit Evaluation (Appendix D to Atlantic Richfield's January 19, 2017 Reference FRI work plan) showed an oval shaped area of groundwater level decline greater than 10 feet as extending about 1,500 feet east to west and about 3,000 feet north to south. Please revise the text to indicate that the radius of influence of dewatering caused by mining activity likely extends much farther in each direction.

Also the stated depth for Tunnel 4 appears to be close to the screened interval for MW-2D. Groundwater is consistently present in MW-2D. This observation is inconsistent with the last paragraph of Section 3.4.3 on page 19 of the report. As noted above, Tunnel 4 was described as yielding some (very little) flow in the 1933 memorandum. The ARC inference regarding restricted dewatering at the pit due to mining appears to be inconsistent with the available evidence and with ARCs own evaluation of the radius of influence of the Pit on groundwater elevations (Appendix D to Atlantic Richfield's January 19, 2017 Reference FRI work plan). Please remove the text regarding restricted dewatering at the pit due to mining, and replace it with a more accurate description of the area dewatered by the underground mine workings and Pit.

Please ensure that all other related sections of the text are also revised to reflect this discussion.

- **Previous EPA comment dated September 27, 2016 S7: Section 4.6.1.1 Property of Leviathan Sulphur Company, Page 46:** The second paragraph describes interpretations based on the reported geometry of Tunnel 3. Please include a figure and cross section that clearly shows the features discussed in the text in relationship to current site features. **ARC Response:** ARC committed to providing the requested plan and cross section figures. **EPA Comment:** The revised figure was much improved. Please ensure that Tunnel 4 is added to Figure 3-2 as described in Comment S2.

- **Previous EPA comment dated September 27, 2016 S9: Section 4.6.1.3 Water Board Meeting with Anaconda Personnel Last Sentence of Paragraph 1, Page 46:** The suggestion inherently assumes that the pre-mining groundwater system was continuous. However, groundwater systems in volcanic terranes are known to be locally compartmentalized due to features such as intrusive dikes, clay altered zones, and/or fracture zones that comprise barriers (or pathways) for water circulation.

Note that drilling along the ridge between the Pit and Overburden area (Between MW-40 and LOC34) encountered clay- altered rock that did not yield groundwater (April 30, 2015 Technical Groundwater Evaluation Meeting Notes and June 8, 2015 Drilling Summary Submittal from ARC to EPA), and might be evidence suggesting the presence of pre-Pit compartmentalized groundwater at the site. If Tunnel 3 penetrated such a barrier and encountered a compartment that was saturated, the pre-Pit groundwater levels could have been substantially higher within the compartment than in other areas of the site. The observations at Tunnel 3 require additional discussion in the text. This is a significant issue if pre-mining groundwater elevations in the area of the Pit were higher than the present day, then less sulfide oxidation than occurs now would have taken place with less associated metals loading to the watershed from the pre-mining site. Please provide a plan view figure and cross section showing the geometry of Tunnel 3, and the inferred water source zone to provide a clear understanding of possible implications of the reported observations of drainage associated with Tunnel 3. **ARC Response:** ARC argued that there is little evidence for compartmentalized flow in the groundwater system at Leviathan Mine and committed to providing plan and cross section figures. **EPA Comment:** The response included reference to Tunnel 4. As mentioned in Comment S2 above, please show Tunnel 4 on Figure 3-2. Also, the stated depth for Tunnel 4 appears to be close to the screened interval for MW-2D. Groundwater is consistently present in MW-2D. This observation is inconsistent with the last paragraph of Section 3.4.3 on page 19 of the report. Please remove the text regarding restricted dewatering at the pit due to mining, and replace it with a more accurate description of the area dewatered by the underground mine workings and Pit.

- **Previous EPA comment dated September 27, 2016 S10: Section 4.6.1.3 Water Board Meeting with Anaconda Personnel Paragraph 2, Page 46 and 47:** Lack of flows and seeps at the elevation of former Tunnel 3 is cited as evidence that groundwater elevations at the Pit were not lowered by more than "a few tens of feet'. Note, that the vertical distance between Tunnel 3 and Tunnel 5 shown on Figure 4-7 is about 65 feet. Thus, if groundwater was above the elevation of Tunnel 3, it is possible to roughly estimate the range of reduction of the groundwater elevation at the Pit since open pit mining began. Please replace the subjective term 'few' with the estimated footage range based on actual data i.e. likely more than 60 feet. **ARC Response:** ARC's response refers to new information about Tunnel 4 that was not included in the TDSR, and argues that there is not an adequate basis for commenting on changes in groundwater elevations at the Pit. ARC committed to revising the text. **EPA Comment:** The text is now at Section 3.4.3, Page 18 and 19. The revised report states that pre-mining groundwater levels may have been up to 60 feet above current groundwater levels. As discussed in Comment S2, the pre-mining groundwater elevation must have been more than 60 feet above current groundwater levels to account for the flows observed by Moore (1933). The text inappropriately limits the extent of groundwater level decline to the immediate vicinity of the lower Pit. Please remove this limitation from the text and replace with a more accurate statement regarding the change in pre-mining groundwater levels.

- **Previous EPA comment dated September 27, 2016 S11: Section 4.6.2 RI Groundw ater Discharge Page 50 Cross Section D-D' (Figure 4-10):** The cross section appears to show that Tunnel 5 may depress the groundwater surface below the Pit by at least 60 feet. If Tunnel 3 had a similar hydraulic impact before open pit mining, the current groundwater elevations could be lowered by about 120 feet in comparison with pre- mining levels. Please revise the text with an estimated numerical range of possible groundwater elevation changes at the Pit. **ARC Response:** ARC referred to the response to comment S10 and committed to revising the text but without a quantitative estimate of the groundwater elevation change. **EPA Comment:** Please provide a

quantitative estimate of the groundwater elevation change and modify the report per previous and current comments on S2, S9, S10, and S11.

- **Previous EPA comment dated September 27, 2016 S16: Section 4.7 Conclusions Regarding Groundwater Flow, page 52 Third Bullet:** The sub bullet text provides subjective descriptions (such as 'not significantly higher', and 'a few tens of feet') of pre-mining groundwater elevations at the Pit'. Measurements from Figures 4-7 and 4-10 appear to support groundwater elevation declines of 60 to 100+ feet since mining started at the site. Please replace the subjective language with a qualified numerical estimate of the groundwater elevation decline. **ARC Response:** ARC referred to responses to comments S9 and S10, and committed to revising the text but without quantitative estimates of groundwater level declines. **EPA Comment:** The revised text should be amended as requested in comments S9 and S10.

- **Previous EPA comment dated September 27, 2016 S17: Section 4.7 Conclusions Regarding Groundwater Flow, page 52 Fourth Bullet:** The text is potentially misleading as to whether dewatering occurred during mining at Leviathan Mine. There are apparently no records of active dewatering during mining at the site. However, groundwater was certainly drained by Tunnel 3 and Tunnel 5 during underground mining, which resulted in dewatering of the future Pit area. Pleas e revise the text to more accurately reflect the likely occurrence of passive dewatering during driving of Tunnel 3, Tunnel 5, and open pit mining. **ARC Response:** ARC referred to responses to comments S9 and S10, and committed to revising the discussion of uncertainties in pre-mining water-level conditions. **EPA Comment:** The revised text should be amended as requested in comments S9 and S10.

- **Previous EPA comment dated September 27, 2016 S27: Section 8.1 Specific Recommendations:** Please ensure that the evaluations outlined in the third through fifth bullets are performed with respect to the groundwater source volumes for each of the Sources (CUD, Delta Seep, Adit, and Aspen Seep). See General Comment 3. The ninth bullet requires additional data to be supported. It i s currently based on evaluation of a truncated data set. Please include data for groundwater elevations from select wells since 2006. Afte r these data are included and evaluated, please revisit the request/recommendations (i.e. reducing the frequency of groundwater level measurement). **ARC Response:** ARC referred to responses to comment G3, and committed to assessing the area and volume of groundwater flow to the acid drainage sources. **EPA Comment:** The revised figures and text include consideration of pre-2010 groundwater elevations, and attempts to evaluate chemical changes along source related flow path. Please revise the text as requested in comments G4 and G5.

- **Previous EPA comment dated September 27, 2016 S28: Data Quality Assessment (DQA).** The QC and DQA steps are not yet completed for the groundwater data. The report is not in compliance with the QAPP Figure 3 flowchart. The report states that the DQA has not been completed. Please see previous EPA comments, meetings, and summary notes on this topic beginning back on April 2, 2015. The findings presented in the current TDSR are regarded as preliminary and subject to change. Please ensure that the full QC and DQA steps are completed within 150 days of each sampling event. EPA has provided comments on the QAPP process and on the reporting process in separate comment letters. Field Memo and Preliminary analytical reports (no QC) and No data interpretation (similar to the annual DSRs but with lower quality data) should be provided 90 days after field work is completed. Subsequent to that, ARC should submit a Technical Data Summary Report/ Draft RIFS section, to include validated analytical

data and data interpretation; within 120 days after field sampling is completed. **ARC Response:** ARC committed to completing DQA prior to preparing an updated groundwater TDSR. ARC suggested that the time for delivery of a TDSR should be no less than 270 days after completion of field sampling. **EPA Comment:** The RI/FS schedule will be addressed under separate comments. EPA's review of the revised report shows that the DQA is still not full y integrated into the remaining text of the TDSR. In fact, the report is unclear whether (1) DQA was performed and the findings are that more data is needed, or (2) whether the DQA was not performed. This lack of clarity makes the DQA text seem either redundant or contradictory. Attachment B contains additional comments regarding the DQA. Please address these specific comments and ensure that the DQA discussion is fully and completely integrated into the TDSR. ARC should include a clear and concise statement of the 5 steps and the findings for each step.

ARC's responses to technical comments prepared by Lahontan Regional Water Quality Control Board, dated May 9, 2016 were evaluated and reviewed by the Regional Board. The Regional Board's analysis of ARC's response to comments dated March 7, 2017 is attached for full consideration and response.

EPA's technical review has also identified the following additional new comments.

- **AC-1, Bullets 4 and 6 Page ES-6:** The bullets appear to be contradictory. The first bullet appears to misunderstand the conclusions of Taylor and Wheeler (1994). That report is clear that the whole rock sulfur represented both sulfide minerals and elemental sulfur (see for example the legend for Figure 6b). The sixth bullet is a more accurate statement. Whole rock sulfur at Leviathan Mine is known to comprise sulfide minerals (and their soluble oxidation products) as well as elemental sulfur. Thus, the most likely finding based on the information presented in Figure 7-67 is that most of the sulfate present at Leviathan Mine resulted from oxidation of sulfide minerals. This is also consistent with most of the report text and should be reflected in bullet summary text as well. Please delete the fourth bullet.

- **AC-4, Section 4.2 Uncertainties:** The text describes various types of uncertainties without discussing how the data reported in the TDSR are affected by these uncertainties. Please follow the steps outlined in the approved QAPP, and revise the text to fully include and evaluate how the decisions being made are impacted, and whether or not the data are sufficient. Please provide this by June 30, 2017, to ensure necessary modifications to the data collection program are made during this 2016 field season

- **AC-5, Section 4.2 Uncertainties:** The text refers to standard operating procedures (SOP) contained in the RI/FS QAPP. Field sampling SOPs were not included in the RIFS/QAPP; they are included in a number of various workplans. ARC should provide one Sitewide RIFS Sampling Analysis Plan appendix. A centralized document that lists and provides of all of these documents in one place. Please revise the text to refer to this centralized document(s) containing all field sampling plans and associated sampling SOPs.

- **AC-6, Section 6.6 Groundwater-Surface Water Interactions and Groundwater Discharge, First Bullet, Page 57:** The text refers to Cross Section A-A'. The bends in the section are not indicated on Figure 6-9. These bends should be clearly shown on the section; and on all of the other cross sections as well. The text describes the direction of groundwater flow appropriately, however, the cross section is not oriented to accurately show the flows described in the text. For

example, the text describes groundwater flow to the southwest, under the Pit, to Tunnel 5 and the Adit; whereas the cross section is oriented north-south through this area. Also, the orientation of the section creates a misleading view of the potentiometric surface under Leviathan Creek and Pond 2 area. The potentiometric surface appears to converge to a low at PZ-39. This contradicts the text describing flow under Leviathan Creek. Please revise the line of the cross section to ensure that the text and the cross section views are consistent.

- **AC-7, Section 7.3.2 Temporal Trends:** The graphs used to assess the temporal trends use a log scale for the 'Y' axis and span several log cycles. This is necessary to show locations and their various concentration ranges. However, the use of the log scale has likely masked temporal variability at the higher concentration ranges (for example sulfate on Figure 7-25, and dissolved nickel and thallium on Figure 33). Please provide additional graphs to compare samples with similar concentration ranges to ensure that significant temporal trends within about a log cycle concentration range are not overlooked.

- **AC-8, Section 7.4.3 Stacked Column Plots, Last Paragraph:** Please revise and reconsider the flow path. The text states that no clear continuum in the evolution of groundwater chemistry along potential flow paths is present. This likely results from comparing information from locations not on the same flow path and/or failure to account for complicating factors along the flow path. The locations on Figure 7-57 appear to be on a flow path, however, the flow path may more appropriately be chosen as: MW-34, MW-5D, Adit (Adit collects groundwater between MW-5D and MW-2S), MW-02S.

  ARC's inclusion of both wells MW-02S and MW-02D is not appropriate. These two wells, are completed within differing water bearing zones. MW-2S appears to be more closely related to the flow path.

  The Durov Plot (Figure 7-22), evaluation of flow along Leviathan Creek, should also be reconsidered. ARC has chosen wells simply based on their location with respect to the flow path, rather than the chemistry of the water. The groundwaters at MW-2S/D are acid sulfate waters affected by migration of groundwater through a source area. Direct comparison of this water with less evolved water from another flow path along Leviathan Creek is not appropriate. Please provide a comprehensive assessment of the factors affecting the chemistry along the Leviathan Creek flow path to ensure full understanding of the chemical characteristics of the groundwater entering the flow path and please also account for mixing of waters that are variably evolved. Please provide a full evaluation of chemical changes along flow paths associated with the acid drainage discharge locations (CUD, DS, PUD, ADIT, and AS) and the known variations of chemistry of inputs along the flow path, and account for the potential for mixing.

- **AC-9, Section 10.1, Conclusions Related to Groundwater Flow, Page 98, First Bullet:** The bullet text does not accurately reflect the observations of Moore (1933) who reported flows of about 750 gpm from the tunnel, and a lower stable flow of about 30 gpm. Please revise this text.

  'Relatively dry' conditions reported for Tunnel 4 indicate a lack of groundwater. However, the reported tunnel depth (140 feet below Tunnel 3) appears to coincide with the screened interval for MW-2D which consistently contains groundwater. Also, Tunnel 5 (the Adit) consistently drains groundwater throughout each year. The current text that the Tunnel 4 level suggests a limited dewatering influence appears to be incorrect. Please revise this text.

No information was presented suggesting a limitation for the radius of influence of the tunnel drains. This sentence should be re written. In consideration of the observations of Moore (1933) and results of the Pit Evaluation, a more accurate statement would be: *These observations suggest that groundwater elevations declined more than 100 feet in the vicinity of the tunnels before the pit was excavated.*

Conceptually, the tunnels contributed to dewatering the rock mass that was later removed during open pit mining, as well as dewatering remaining in-situ rock. Excavation of the pit is also expected to have resulted in further dewatering of the surrounding rock mass. A portion of the dewatered area is shown by the deflection of the potentiometric surfaces at the pit area on Figures 6-3, 6-4, 6-5, and 6-7. The Pit Evaluation (Appendix D to Atlantic Richfield's January 19, 2017 Reference FRI work plan) shows an oval shaped area of groundwater level decline greater than 10 feet as extending about 1,500 feet east to west and about 3,000 feet north to south. Please revise the text to be consistent with the available information.

- **AC-10, Section 10.2, Conclusions Related to Groundwater Chemistry and Isotope Results, Page 99, Fifth Bullet:** Please revise the bullet to reflect all available information. In addition to the geologic unit each well is completed in; please revise the text to fully assess and include consideration of proximity to mine features with respect to groundwater flow directions. The highest metal concentrations in bedrock wells may be accurate; however, it is important to also reference and include information such as location of the high metal concentration bedrock wells with respect to the area/volume of bedrock dewatered by the mine tunnels and pit.

- **AC-11, Section 10.2, Conclusions Related to Groundwater Chemistry and Isotope Results, Page 99, Sixth Bullet:** The evaluation of chemical changes along flow paths associated with the acid drainage discharge locations (CUD, DS, PUD, ADIT, and AS) should be revisited and the known variations of chemistry of inputs along the flow path, and potential for mixing, and other geochemical processes should be accounted for. please revise the text to include a full and complete evaluation of the available information.

- **AC-12, Section 10.2, Conclusions Related to Groundwater Chemistry and Isotope Results, Page 99, Tenth Bullet:** The text seems to misunderstand the conclusions of Taylor and Wheeler (1994) which clearly noted that the whole rock sulfur represented both sulfide minerals and elemental sulfur (see for example the legend for Figure 6b). Whole rock sulfur at Leviathan Mine is known to comprise sulfide minerals (and their soluble oxidation products) as well as elemental sulfur. Thus, the most likely finding based on the information presented in Figure 7-67 is that most of the sulfate present at Leviathan Mine resulted from oxidation of sulfide minerals. This is also consistent with most of the report text (including the second bullet on Page 100) and should be reflected in bullet summary text here as well. Please revise the text.

Attached also, please find a copy of the May 10, 2016 comments from the Lahontan Regional Water Quality Control Board for your full consideration and response.

As previously discussed, by June 30, 2017, please provide a revised groundwater technical data summary report (TDSRs) (along with the Stream Sediment/Floodplain Soil TDSR, and Reference TDSR) to be responsive and incorporate all EPA comments.

Any written response to comments should include a page and paragraph number of where the changes were made. The actual revised document should be provided in a redline format, so that the changes responsive to EPA comments can be easily identified and reviewed.

Within 30 days, ARC should provide a response that it concurs with these comments and will incorporate them as requested. Should ARC find that they disagree, do not concur, or will not incorporate EPA comments, then this should be discussed with EPA immediately to ensure that these submittals in June are satisfactory. Please ensure TDSRs are full complete, responsive and sufficient to act as a template for all other media reports/chapters for inclusion in a Site Characterization complete with End Point Concentrations by December 31, 2017.

If you have any questions, please feel free to contact me at (415) 947-4183 or Deschambault.lynda@epa.gov.

Sincerely,

Lynda Deschambault
Remedial Project Manager

Cc by electronic Email:
Douglas Carey, California Regional Water Quality Control Board, Lahontan Region
Michelle Hochrein, Washoe Tribe of Nevada and California
David Friedman, Nevada Department of Environmental Protection
Kenneth Maas, United States Forest Service
Tom Maurer, United States Fish and Wildlife Service
Toby McBride, United States Fish and Wildlife Service
Steve Hampton, California Department of Fish and Wildlife
Marc Lombardi, AMEC.

Attachment A (Six Pages)
Previous Comments

Previous EPA comment dated September 27, 2016 G3: Groundwater potentiometric surface: The report provides figures showing the groundwater potentiometric surface interpreted from two time periods: November 1982 during a wet period, and November 2014 after three years of drought. While the report provides a general comparison of site-wide groundwater gradients between 1982 and 2014 potentiometric surfaces, there is no mention of any comparison of groundwater elevation changes, or changes to groundwater flow paths between the two time periods. Groundwater elevation data from 1998 and 1999 (SRK), 2006 to 2010 (Tetra Tech, USACE, and Burleson), and 2010 to 2012 are not fully considered. These data should be used to augment the hydrographs of Appendix 4A, and used to compare additional representative potentiometric surfaces to assess temporal changes to
the groundwater surface (and groundwater flow) at the site. As-is the report gives the impression that groundwater flow has been consistent through time across the site. Incorporatin g evaluation of the additional information mentioned herein will provide a more comprehensive understanding of how the potentiometric surface and groundwater flow vary through time. **ARC Response:** ARC committed to adding historical groundwater elevation data to the hydrographs. **EPA Comment:** The January 25, 2017 report includes a much improved summary of historical and current groundwater elevations and flow paths. The response is adequate.

- **Previous EPA comment dated September 27, 2016 S3: Executive Summary, Groundwater Flow System, Preliminary Water Budget, Second Sub-Bullet on Page 7:** The text states an assumption regarding the saturated thickness of the bedrock. Please include text to substantiate this assumption. An evaluation of the significance of variation from this assumption on the water balance should also be provided within this section of the report. **ARC Response:** ARC committed to providing the requested information. **EPA Comment:** The ARC response is adequate.

- **Previous EPA comment dated September 27, 2016 S4: Section 4.2.2 RI Groundw ater Flow Directions, Page 39 first Paragraph:** The text discusses groundwater flow based on the potentiometric surface in bedrock and native materials (ACSA, PSA, and LCSA) and a local perched zone (ACSA). The text does not include evaluation of the potentiometric surface(s) in mine waste. Please provide figures to show groundwater elevations measured within the mine waste; and a separate figure that contrasts groundwater elevations from the native materials and bedrock. This information is necessary to support evaluation of the significance of groundwater elevations observed within the mine waste compared with those in native material and bedrock. Such figures and text would also facilitate understanding the basis for combining the native material and bedrock potentiometric surfaces while disregarding the mine waste groundwater elevations. **ARC Response:** ARC committed to proving an evaluation of groundwater elevations within mine waste. **EPA Comment:** The ARC response is adequate.

- **Previous EPA comment dated September 27, 2016 S5: Section 4.2.2 RI Groundw ater Flow Directions, Page 39 First Paragraph: The text refers to Figures 4-7 through 4-11.** These figures are the basis for preliminary observations in the subsequent bullets. The figures are misleading. It is important that data indicate the level of confidence that should be placed in the inferred flow directions at the streams. For ex ample, the entire potentiometric surface and equipotential lines to the southwest of Leviathan Creek on Figure 4-7 is unconstrained by data from the time period selected by the authors. It is likel y that the surface and lines could be inferred based

on groundwater elevations made on other dates than November 2014, however there is no way to determine this from the figure or associated text. Please update the figures to include a different pattern (i.e. Dashed lines) to show poorly constrained equipotential lines and surfaces, or provide figures representing a time period with measurements that constrain the potential surfaces and lines in this area. **ARC Response:** ARC committed to revising the figures and providing additional figures. **EPA Comment:** The revised figures are acceptable. The ARC response is adequate.

- **Previous EPA comment dated September 27, 2016 S6: Section 4.4 RI Groundwater Level Trend Page 42:** The last sentence of the section states that "A slight longer-term decline in groundwater levels occurred from 2011 to 2014 in response to lower amounts of annual recharge". 'Slight' is a subjective term and should be replaced by a range of actual footage declines. Because groundwater elevation data are available from the 1980s, 1998/99, and from 2006 through 2014, a more comprehensive discussion of groundwater elevation trends is necessary. Please include sufficient text and figures for understanding groundwater elevations (and flow) at the site beyond the current limited information from 2010 to 2014. **ARC Response:** ARC revised the text and added historical data to hydrographs. **EPA Comment:** The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S8: Section 4.6.1.2 Shallow Groundwater Flow in the Vicinity of the Pit, page 45: The reference cited as the basis for this text was not published by USGS. This information is from: Prudic, D., and Hammermeister, D., 1985, Shallow Ground Water Flow in the Vicinity of the Open Pit at Leviathan Mine. Unpublished draft manuscript. Please provide a copy of this reference for EPA review. **ARC Response:** ARC attached the reference to the response to comments letter. **EPA Comment:** The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S12: Section 4.6.2 RI Groundwater Discharge Page 50 and Cross Section E-E' (Figure 4-11): The text identifies Leviathan Creek as a probable groundwater flow divide. It is unclear if the text is attempting to imply that Leviathan Creek is a losing stream or is a discharge point along Section E-E'. The figure does not clearly support either interpretation. There is insufficient information provided. Please revise the text and add figures to support the statements made about the surface water / groundwater relationship along this reach of Leviathan Creek. **ARC Response:** ARC explained that investigations of surface water-groundwater interactions along Leviathan Creek are ongoing. **EPA Comment:** ARC should address the comment about Leviathan Creek being a groundwater divide. The revised report was adequate.

Previous EPA comment dated September 27, 2016 S13: Section 4.6.2 RI Groundwater Discharge Page 50 and Cross Section E-E' (Figure 4-11): The figure shows the CUD in relationship to November 2014 groundwater elevations and indicates that only a very short reach of the CUD intersects the groundwater surface. Implying that only a limited length of the CUD receives groundwater inflow. Please provide a more comprehensive assessment of the CUD and this portion of the site groundwater flow system. The figure should include reported locations of seeps that necessitated construction of the CUD, along with the historical range of groundwater elevations in relationship to the CUD and the seeps. Please include text to describe this additional information. **ARC Response:** ARC revised the text and figure to provide a more accurate depiction of the CUD. **EPA Comment:** The ARC revised report is adequate.

Previous EPA comment dated September 27, 2016 S14: Section 4.6.2 RI Groundwater

Discharge Page 50 and Cross Section E-E' (Figure 4-11): The equipotential lines downstream from the vicinity of MW-10D are unsupported by the data provided. These equipotentials should be removed from the figure, or the source for data supporting the equipotentials should be included. **ARC Response:** ARC revised the text, and agrees to incorporate new information as it becomes available, and adding question marks to inferred equipotentials in future figures. **EPA Comment:** The revised figures are adequate.

Previous EPA comment dated September 27, 2016 S15: Section 4.7 Conclusions Regarding Groundwater Flow, page 52 Second Bullet: The text discusses observations of groundwater encountered at Tunnel 3. As requested above, a figure and cross section showing the reported geometry are necessary to support this. **ARC Response:** ARC committed to providing the requested figures. **EPA Comment:** The requested figure was provided in the revised report. The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S18: Section 5.4 Geochemical Trends and Water Types at Leviathan, Page 56: Stiff diagrams are used to identify water types based on principal ions present. Please include Piper Diagrams as well. Piper Diagrams are typically very useful for identifying water types based on the principal ions and if carefully considered are also useful for identifying chemical trends and processes along groundwater flow paths. Please include Piper Diagrams to more clearly identify groundwater chemical types and trends along selected flow paths. **ARC Response:** ARC agreed that Piper diagrams would be useful and committed to providing Piper and/or Durov plots and associated explanatory text. **EPA Comment:** The revised report includes Piper and Durov plots to evaluate geochemistry at the site. The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S19: Section 5.4.1 Geochemical Trends and Water Types at Leviathan, Page 56: The text refers to graphs of metal concentration over time in Appendix 5-A. The graphs show trends in general, however, it is extremely difficult to differentiate specific locations on the graphs. Please redraw the graphs to allow matching specific plots with the associated location. The statement in the text that '…there appear to be seasonal variations in concentrations in several monitoring wells…' should introduce a more detailed description and evaluation of trends for the metals by Source, to support understanding of contaminant sources, fate and transport necessary to identify remedial response. **ARC Response:** ARC committed to revising the figures after use of exploratory data analysis and construction of Durov Plots to identify select wells. **EPA Comment:** The revised graphs are adequate.

Previous EPA comment dated September 27, 2016 S20: Section 5.4.2 Spatial Distribution, Pages 56 and 57: The text provides a very general discussion of analyte spatial distribution in groundwater at Leviathan Mine. Please substantially add text and graphics with information useful to understanding the nature and extent of groundwater contamination. For example, the graphics consist of concentrations or parameter measurements posted to site plan-view diagrams and lack any interpretive aids such as concentration contours or other methods of showing distribution. This lack of analysis leads to overly broad generalizations regarding contaminant distribution such as the assertion that low pH is centered at the Pit while pH at MW-31 and MW-39, both north of the Pit area, have pH of 2.16 and 2.75 (both lower than all but one pH measurement in the Pit) and elevated metals contents. Further, at least four wells to the west of the Pit area are shown as having pH between 3 and 4. The text is correct in stating that there is a relationship between low pH and high metal concentrations, additional analysis of the spatial distribution of acid and metals at the site are necessary to support the general statement that acid and

metals are 'centered at the Pit'. Please re-write this section to identify and summarize the distribution of key metals and related chemicals in groundwater at the site in a manner that facilitates understanding the nature and extent of contamination, and identification of remedies. **ARC Response:** ARC committed to revising the discussion of metal nature and extent in a manner that supports evaluation of remedies in the feasibility study. **EPA Comment:** The revised report text is adequate.

Previous EPA comment dated September 27, 2016 S21: Section 5.4.4 Water Types – Stiff Diagrams: The text inaccurately states that Stiff diagrams plotted with consistent scales do not allow identification of recognizable shapes. Figure 5-8 showing Stiff diagrams plotted with a consistent scale clearly shows recognizable shapes for differing types of water. The text should be revised accordingly. Figures such as 5-8 allow rapid comparison of water type by location (spatial analysis) while also conveying the relative ionic strength of the water. Similarl y plotting Stiff diagrams from the same well representing samples collected at different times allows rapid evaluation of temporal trends in water chemistry. Please provide Stiff diagrams to assess temporal changes in water quality at the site. Please revise the text to clearly identify any spatial or temporal water chemistry trends present in the data set. **ARC Response:** ARC states that the text will be modified to discuss the benefits and limitations of Stiff Diagrams and commits to providing figures to show temporal and spatial trends at the site. **EPA Comment:** The revised report contains the requested figures and the response is adequate.

Previous EPA comment dated September 27, 2016 S22: Section 5.5.1 Box and Whisker Plots: Please provide and display the number (n) of observations used to construct each of the box and whisker plots on each graph. This information is necessary to identify if a narrow range of concentration is related to a low number of observations as compared with other samples that may show a wider range of concentration. **ARC Response:** ARC committed to posting the number (n) of observations used to construct each of the box and whisker plots. **EPA Comment:** The number (n) of observations is posted to figures in the report. The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S23: Section 5.6.1.1 Results of Tritium Analysis: Please provide relevant age classification criteria on Figure 5-23. Please provide the age classification criteria plotted as lines or as shaded areas. **ARC Response:** ARC committed to revising the figure to show the age classification criteria. **EPA Comment:** The revised figure shows the age classification criteria as requested. The ARC response is adequate.

Previous EPA comment dated September 27, 2016 S24: Section 5.6.2.4 Sulfate Isotope Analyses Results: The discussion omits a key observation based on the ^{34}S (o/oo) CDT values. This observation is that the ^{34}S (o/oo) CDT values for the majority of the samples shown on Figure 5-31 are consistent with oxidation of sulfide minerals as the source for the sulfur isotopes of dissolved sulfate, consistent with the findings of Taylor and Wheeler (1992). The implication is that oxidation of sulfide minerals is the source for most of the sulfate (and acid) at Leviathan Mine. This observation is significant with respect to assessing potential remedies at the site where abundant native sulfur is present in addition to the sulfide minerals. This observation should be included in Section 5.6.3. **ARC Response:** ARC explained the reasoning for a slightly different view of the source for sulfate in acid drainage at Leviathan Mine than that provided in EPA's comment and committed to revising the discussion stable sulfur isotopes. **EPA Comment:** The revised figures allow comparison of the site data with that of Taylor and Wheeler (1992) and are adequate.

Previous EPA comment dated September 27, 2016 S25: Section 5.7 Groundwater Chemistry Summary: Please resolve the inconsistency in the test in the first two bullets. It is not clear how

both of these statements can be made: ' generally no temporally changes' and 'metals concentrations in some wells appear to be influenced by seasonal changes…' **ARC Response:** ARC committed to resolving the inconsistency. **EPA Comment:** The revised text is adequate.

Previous EPA comment dated September 27, 2016 S26: Section 6.2 Reference Area Concentrations Page 72 Second complete paragraph: The text appears to be editorializing in response to EPA comments and direction. The text also appears to contradict the first two paragraphs of Section 8.0 Recommendations (page 77) that note that the groundwater system downgradient of the Delta Slope and Aspen Seep Bioreactor, including along Leviathan Creek downgradient to the confluence of Leviathan and Spent Creeks has yet to be characterized. The unsupported text should be deleted from this section 6.2. **ARC Response:** ARC committed to revising the text based on new information from perimeter wells drilled during 2016, and to remove inconsistent text. **EPA Comment:** The revised text is adequate.

Attachment B (Two Pages)
Comments Specific to the Data Quality Assessment

Specific Comment 1: Section 5.3 Data Quality Assessment – This section correctly lists the 5 steps explained in the RI/FS QAPP, which are:

Step 1: Review the DQOs and sampling design
Step 2: Confirm data review results to evaluate the data quality
Step 3: Select statistical test(s), as appropriate, to evaluate data usability.
Step 4: Verify assumptions.
Step 5: Draw conclusions about the quality and usability of the data (data report will state conclusions regarding the data quality and usability of the results.

The last paragraph states "The Final RI Report will provide a complete reconciliation of the data with the project DQOs. The reconciliation process will evaluate if enough data has been collected, if objectives of the investigation have been met, and if data gaps exist requiring additional sampling and analysis. The evaluation will also provide an assessment of whether study objectives were realistic and whether data are appropriate, sufficient, and usable in consideration of the evaluation criteria set forth in the DQOs. Components of the reconciliation with DQOs include DQA. "
The QAPP defines the DQA process. The "reconciliation of the data with the project DQOs" is a new phrase being introduced in this 2017 GW TDSR. This phrase is not necessary, since it is describing the DQA. This phrase should be removed. Also, based on the statements in this paragraph, the DQA for the GW data has not been performed. DQA should be performed on each data set as it becomes available. For example, DQA should be performed for each year groundwater data as it is generated.

Specific Comment 2. **Section 5.3.1 Step 1: Review of DQOs and Sampling Design:** Under Section 5.3.1., the text states "The groundwater data collected to date are appropriate for addressing the DQOs. However, as RI data collection is still on-going, the DQOs have not been fully satisfied. Section 9.0 of this report describes the reconciliation of data collected to date with the DQOs and provides an update to the GWCSM." This is very confusing – it is stating both that Step 1 has and has not been performed. Furthermore, the reader is directed to another section of the report to find the answer to Step 1.
The QAPP states "The DQA is performed on an iterative basis as planned data becomes available (i.e. after data verification and data validation is complete) to determine whether the project-specific DQOs are being satisfied. DQA consists of five steps that relate the quality of the results to the intended use of the data:" Therefore, the DQA should be performed for the data set provided in the 2017 GW TDSR. Due to contradictory statements, it is unclear if Step 1 of the DQA is complete or not for the dataset discussed in the 2017 GW TDSR. The text should clearly stat whether DQA is complete or not for the available data.

Specific Comment 3: **Section 5.3.2 Step 2: Preliminary Data Review:** This section is subdivided into Non-RI Data and RI Data and refers the reader to Section 7.0 for non –RI data, and Appendix 5-A (Data Summary Worksheet) for the RI data. (The text also lists some assumptions used for mapping the data, which seems out of place in this section.)
The text states "The second major component of the preliminary data review is conducting exploratory data analysis. The approach varies based on the type of data collected, but typically includes tabulating and plotting the data, and calculating descriptive statistics. Exploratory data analysis is in progress for the RI groundwater data. The presentation of data in this document is a component of exploratory data

analysis. This step is on-going for the RI groundwater data." Furthermore, the later Step 3 includes the discussion of statistical methods used. The QAPP and RI workplans and sampling plans should adequately explain the processes and data quality review, without the need to have additional categories of data review and terms.

Specific Comment 4. Section 5.3.3 Step 3: Select the Statistical Method: The text explains that the statistical methods include both contouring and statistics, and that statistics will be non-parametric because the text explains the data does not follow a normal distribution.
The text further explains that there are decision problems and estimation problems and in a very confusing manner attempts to explain examples of the difference and that statistics will be used in some situations for both types of problems. This paragraph is a jumble of concepts and should be rewritten to clearly list the statistical methods used and for what purpose. If statistical methods are not used for comparing datasets or for identifying values or properties, state the situations and what method is used. This might be better explained in a table listing the statistical methods or other data review methods. Later, under Section 5.4 Data Interpretation Methods, there are details provided about comparisons of datasets, which appear to be part of the Step 3 methods.
This section could be combined with Step 3 for clarity and less redundancy. In fact, the discussion of Step 3 in the QAPP includes the list of types of data evaluation tools – such as graphs, maps, tables, etc.

Specific Comment 5: Appendix 5A also includes table 5A-4, Statistical Summary of 2010-2015 Data Quality Groundwater, and provides number of sample records and percentages of completeness (based on data records analyzed.) This should be mentioned in the Step 3 discussion.

Specific Comment 6, Section 5.3.4. Step 4: Verify the Assumptions of the Statistical Method. This section states that the assumptions will be verified later.
And Section 5.3.5 Step 5: Draw Conclusions from the Data. This section states that no conclusions have been made. However, Appendix 5-A, Data Quality Summary Worksheet – RI/FS Groundwater, provides several conclusions about the data quality.
Based on the discussion in the last two steps, the DQA has not been completed for the groundwater data included in this 2017 TDSR. However, Section 5.3.6 Summary is actually Step 5 and explains that the groundwater chemistry data collected between 2010 and 2015 is of good quality, with limited data qualification, and can be used for analysis. Because some of the DQA steps are not complete, it is unclear whether the DQA has actually confirmed this statement. Furthermore, Appendix 5-A should be referenced in this section, since it provides the information to support the review of data quality. Since additional data is planned to be collected, analyzed, and validated, the DQA Step 5 conclusion would be the place to explain the deficiencies in the groundwater dataset.

Specific Comment 7, Appendix 5A Data Quality Summary Worksheet – RI/FS Groundwater and Data Tables: This worksheet and the associated summary data tables were reviewed and were in compliance with the revised RI/FS QAPP requirements and previous comments, and summarize the achievement of the PARCC criteria based on data validation. It was noted that the completeness calculations in the Appendix 5A Data Quality Summary Worksheet were based on number of planned samples collected; whereas, the completeness calculations in Table 5A-4 were based on total data records and was appropriately footnoted on the table to indicate how the completeness was calculated.